Understanding the Environmental Footprint of Telecommunications

The Transformation of the Municipal Workplace through Broadband Connectivity

February 12, 2021

Contents

Context

The Association of Municipalities of Ontario (AMO) is a non-partisan, non-profit association representing municipal governments across the province. Municipal governments work through AMO to achieve shared goals and meet common challenges. One of these challenges is how to better integrate infrastructure investment, climate change and social policy into a municipal Council's decision-making process.

The shift toward thinking of infrastructure, the environment, and social policy as complementary, rather than competing interests has created a more holistic approach to policy and decision making. Ontario municipal governments support this shift and have requested that AMO provide a series of Climate Change discussion papers to help municipal Councils demonstrate action in this area.

This is the second discussion paper of AMO's Climate Change Series. It argues that municipal Councils should examine the environmental benefits associated with enabling municipal employees to work-from-home during the coronavirus (COVID-19) pandemic, and potentially telecommute in a post-pandemic world. Starting to measure what municipal governments have direct influence over (e.g. their own operations), is the best way to study the possible link between having access to high-speed, affordable, and reliable telecommunications services (broadband and cellular) and lower greenhouse gas (GHG) emissions at the local level.

Introduction

Residents in communities across Ontario are looking to municipal leaders to act to reduce the dangerous effects of climate change. Many municipal councils have made climate emergency declarations in response. This paper provides municipal elected officials with an opportunity to demonstrate the impacts, if any, that COVID-19 is having on the environment from a municipal operations perspective.

In the municipal sector, the options to telecommute or work-from-home have traditionally been used to supplement in-person and in-office work. However, since March 2020, the COVID-19 pandemic has required that workplaces shift to move as quickly as possible to a work-at-home structure to help contain the spread of the virus. This has required municipal governments to adapt and implement policies, practices, and technologies that facilitate a non-centralized working environment for employees, and service delivery model for residents.

While some municipal governments have tracked how the municipal workplace has temporarily changed at an individual level, there has not been a concerted effort to examine the local environmental impacts COVID-19 has had on the sector.

Measuring how employees' commuting patterns, travel and accommodation requests have changed before and during the pandemic are just some examples of key performance indicators (KPIs) that municipal governments can measure. Others include how the municipality's energy, waste, and public works costs have decreased or increased, as more employees shift to a work-from-home environment.

AMO recognizes that municipalities are likely to return to in-person work and service delivery in some manner once most of the population has been vaccinated against COVID-19 and there is herd immunity. That does not, however, preclude municipal governments from starting to measure the

linkages between COVID-19, their environmental footprint, and access to high-speed, affordable, and reliable broadband and cellular connectivity.

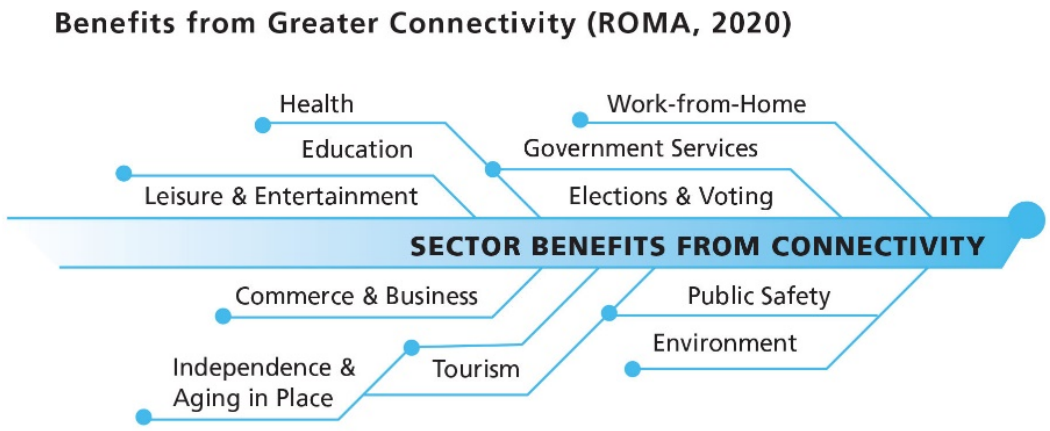
Connectivity & the Changing Workplace

Before COVID-19, researchers focused on the linkages between environmental impacts and the phenomenon to telecommute, which is defined as the ability for employees to work from a distance without having to commute to the central place of work. This could mean working from home, or at a location close to home, such as a coffee shop, library, or co-working space.

Employees who, by contrast, "work-from-home", are those who are stationed at home permanently and do not have an office available to them to work. COVID-19 put municipal governments into a unique situation whereby those who already telecommuted, and those who worked in-person most of the time, were forced into a work-from-home model where there is no feasible option to commute back to an office for the foreseeable future.

This shift was enabled by access to high-speed, affordable, and reliable broadband and cellular connectivity. As laid out in the Rural Ontario Municipal Association (ROMA) Connectivity Primer, connectivity provides municipal governments with an opportunity to provide services to residents in new and innovative ways.

Figure 1: Benefits from Greater Connectivity (ROMA, 2020)



More information on broadband connectivity can be found on ROMA's and AMO's respective websites.

Benefits of Telecommuting on the Environment

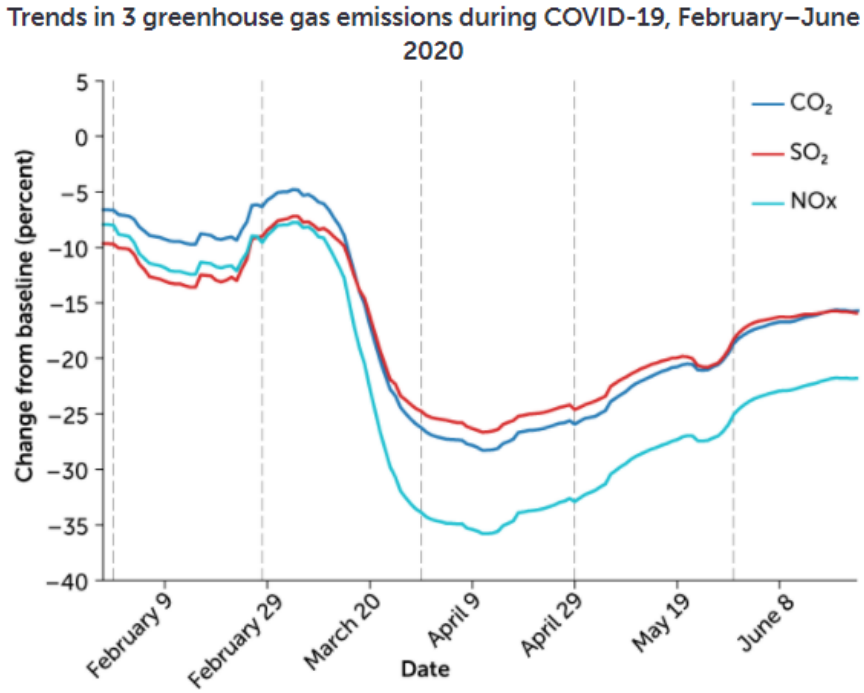
Connectivity offers positive environmental, economic, and social benefits for municipal governments across Ontario. From an environmental perspective, telecommuting has the following benefits:

- Slows Global Warming;
- Redistributes Wealth;
- Increases Employee Time & Productivity;
- Reduces Traffic Jams & Defers Infrastructure Spending/Upgrades; and,
- Saves Employers Money that can be Redirected Back into the Local Economy.

COVID-19 has made a substantial, yet time-limited global impact on GHG emissions. Some researchers estimated that based on people's movements global GHG emissions fell roughly 10 to 30 percent, on average, during April 2020. While this is likely not at a sustainable level given that lockdowns are not permanent, transportation has a large impact on GHG emissions. Staff within municipal governments, whether by traveling for work or commuting into the office contribute to this.

The chart below shows how anonymized cell phone mobility data estimated how average global emissions changed relative to baseline levels for carbon dioxide, sulfur dioxide, and nitrogen oxides.

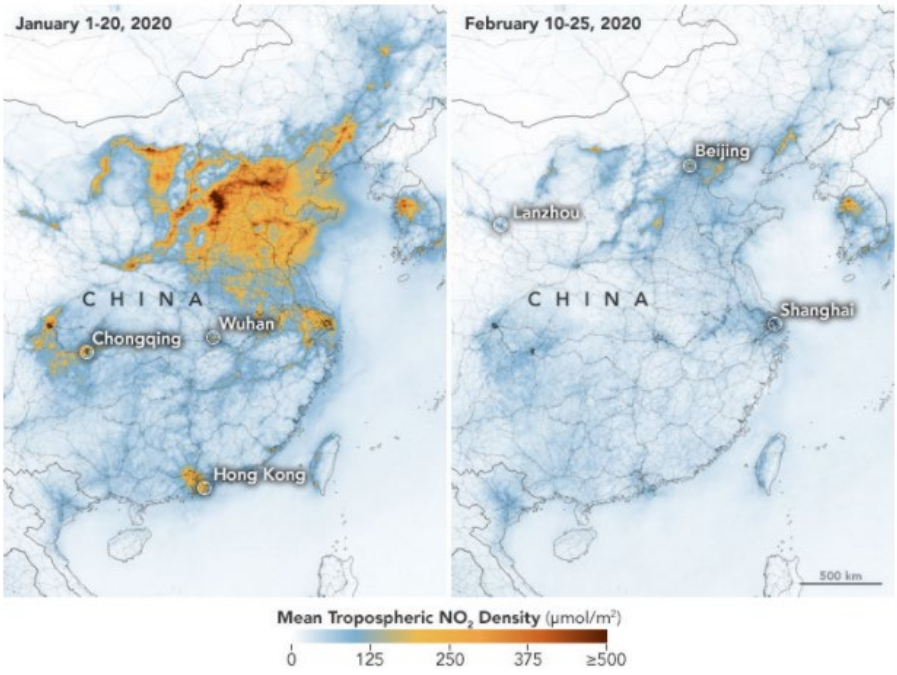
Figure 2: Precipitous Drop in GHG Emissions During COVID-19, Feb – June 2020 (Science News, August 2020)



P.M. FORSTER *ET AL/NATURE CLIMATE CHANGE* 2020

Another way to measure the difference is in air pollution reductions based on less travel and movement. Below is a chart that shows satellite readings how China's air has been cleaner during the COVID-19 outbreak to illustrate these differences.

Figure 3: China's Air Pollution Comparison – Jan & Feb 2019-2020 (NPR. Org, March 2020)



At a local level, researchers like Dr. Helen Hambly and Jamie Lee from the University of Guelph conducted a study found that, in the region of southwestern Ontario, Niagara and Caledon, an average telecommuter's surplus in terms of costs saved, including opportunity cost ranged between $8,820 to $23,964 per annum per telecommuter, depending on the number of days telecommuted per week for home and primary residence dwelling type.

Figure 4: Telecommuter Surplus & GHG Mitigation (Hambly, AMO Conference, 2020)

Telecommuter Surplus & GHG Mitigation

HALTON REGION (2019)

	Estimated annual economic net benefit ($ saved)
First telecommuter in household (n=573)	$15,929 a
Second telecommuter in household (n=200)	$12,542 b
	Estimated annual environmental benefit (kg of CO2 saved)
First telecommuter in household (n=590)	2,733 c
Second telecommuter in household (n=206)	2,153 d

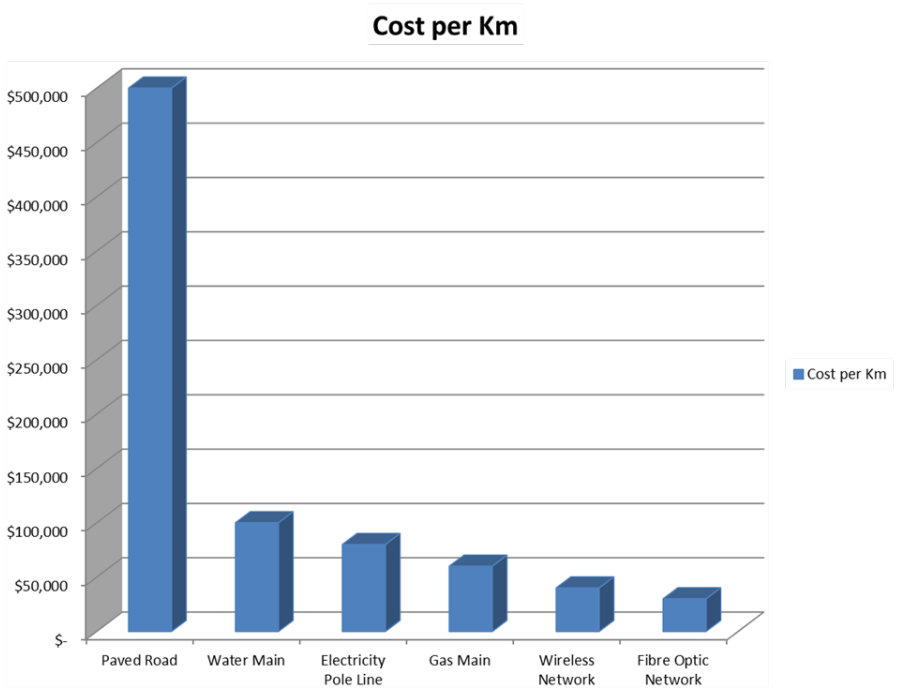
DURHAM REGION (2020)

	Estimated annual economic net benefit ($ saved)
First telecommuter in household (n=352)	$18,913 a
Second telecommuter in household (n=113)	$10,358 b
	Estimated annual environmental benefit (kg of CO2 saved)
First telecommuter in household (n=371)	3,205 e
Second telecommuter in household (n=123)	1,812 f

a: Annual net benefit for an average of ~3.1 days a week telecommuting.
b: Annual net benefit for an average of ~2.75 days a week telecommuting.
c: Annual CO_2 reduction for an average of 88 km/day commute.
d: Annual CO_2 reduction for an average of 76 km/day commute.
e: Annual CO_2 reduction for an average of 96 km/day commute.
f: Annual CO_2 reduction for an average of 66 km/day commute.

Taking advantage of this option requires access to high-speed, affordable, and reliable connectivity. Note that based on a cost per kilometre of build, broadband (fibre optic network) is less costly when compared to building other infrastructure such as paved roads, water main, or electricity pole lines.

Figure 5: Infrastructure Cost Comparison by Cost per KM (Hambly, AMO Conference, 2020)



Telecommuting has also been attributed to lower GHG emissions. In 2017, University of Québec researchers found that "working from home is associated with decreases in overall travel time by 14 minutes and increases odds of non-motorized travel by 77%." Others have estimated that "on average, if commuters could telecommute one day a week, that alone would reduce traffic volume by 20%."

Finally, telecommuting has also been linked to positive health impacts. According to a Flex Jobs' 2019 Annual Survey, "78% of people said having a flexible job would allow them to be healthier and 86% said they would be less stressed."

A global staffing firm Robert Half released survey results in January 2020 that estimated that only 43% of professionals in Canada had employers that provided the option to work off-site. As is well-known, this changed drastically in March 2020, when the Province introduced its first Declaration of Emergency to contain the spread of COVID-19.

Informing Decision-Making for Municipal Councils

With the COVID-19 pandemic nearing one-year in, municipal governments should have an opportunity to measure how these changes have affected, if at all, GHG emissions, energy usage, and infrastructure costs affiliated with deferred operations and maintenance. These will be explained in further detail in the next section.

Measuring these changes over years' previous will help municipal Councils to inform future planning and projections and improve decision-making in the following ways:

- **Determine what physical space & facilities are needed within their communities** – can earmarked costs associated with re-building or expanding municipal spaces be better distributed to other priorities based future needs? (note that this may change Asset Management Plans.)

- **Reconsider priorities around infrastructure spending** – if applicable, can some costs affiliated with roads and bridges be re-distributed to improving broadband and cellular connectivity in the community?

- **Further work on climate change and reporting** – it provides municipal governments who have declared a climate change emergency to measure impacts and reductions in GHGs that can be integrated into a report back to Council on what improvements have been made.

- **Inform the return-to-work strategy for employees and the corporation** – recognizing the shift to nearly 100% telecommuting or work-from-home is not permanent, the KPI's may help inform a return-to-work strategy on who is prioritized to go back when and integrate this with other decision-making factors.

Getting Started: Key Performance Indicators

This chart below is a preliminary list of KPIs that can be used to build a toolkit and tailored to your municipal government's unique circumstances. For example, municipalities who have a large portion of employees who commute (e.g. Greater Toronto Hamilton Area), may attempt to measure deferred GHG emissions and track against productivity. Others may focus on deferred energy and waste costs associated with facilities that have not been in operation based on provincial orders to shut down.

In any case, these indicators should be integrated into existing climate change plans, municipal energy plans, and other strategies, rather than created as a standalone document.

Activity	Importance	2019 Levels	2020 Levels	+/- Change
Connectivity & Telecommuting				
Number of employees working-from-home that would normally commute into the office	Finding the benchmark data will assist in tracking how 2020 levels changed.			
How many employees in a typical year would travel to work via GO Train, Car, etc.				
SIGNIFICANCE: Based on the estimated kms not traveled, calculate the reduction in GHG emissions	What are the environmental impacts related to this reduction in commuting?	What is the GHG/km/car? (e.g. a typical passenger vehicle emits ~ 4.6 metric tons of CO_2 per year).		
Travel & Accommodation				
Number of flights taken by Municipal Council and/or staff	Were the travel and accommodation budgets less/more substantial than			

Activity	Importance	2019 Levels	2020 Levels	+/- Change
Number of train trips taken by Municipal Council and/or staff	anticipated? What type of trips ought to be prioritized in a return-to-work environment, and which should not?			
Number of car trips (# of rentals, total kms expensed) - taken by Municipal Council and/or staff				
Accommodation costs Expensed by Municipal Council and/or staff				
SIGNIFICANCE: Based on the estimated kms not traveled, calculate the reduction in GHG emissions	Based on these deferred trips, how many GHG emissions were reduced?	What is the GHG/km/train trip saved? What is the GHG/miles/air trip saved?		
Energy & Waste Costs				
Operating costs/energy usage for and in municipal buildings and facilities	Were these costs less/more substantial than anticipated? What was the total value saved, how can those emissions be quantified? What costs are necessary in a return-to-work setting and which are not?			
Fuel and utility costs in Municipal Fleets				
Waste removal costs from office buildings and other public spaces				
Paper/printer maintenance and office supply costs				
SIGNIFICANCE: Based on these usual costs, how much energy and waste reduction has been saved?	Based on these deferred costs, what is the environmental impact?	What are the BTUs of heat in a building saved? Was there a noticeable reduction in waste collection costs in facilities, municipal buildings?		

Activity	Importance	2019 Levels	2020 Levels	+/- Change
Public Works				
Condition of the municipal roads, bridges, sidewalks, street infrastructure	Was there any deferred work due to reduced use? Or did the work shift to less central areas?			
SIGNIFICANCE: Has this data provided line of sight into what costs can be deferred longer-term, or are these all temporary until municipal offices reopen to full complement?	What investments, if any, deferred regarding infrastructure?	Based on these findings, is there an opportunity to re-evaluate existing asset management priorities?		

Conclusion

The COVID-19 pandemic has, seemingly overnight, changed the way that municipal governments safely provide essential services to residents and its employees. Understanding the environmental impacts of these moves can help inform the municipal corporation about what costs have been simply deferred or shifted to employees, and whether there are financial tradeoffs to be made to reduce GHG emissions in a sustained way. Comparing data across these areas can also assist Councils in communicating the tangible benefits telecommuting and working-from-home makes on climate change.